

Name \_\_\_\_\_

Period \_\_\_\_\_

# Chemistry I

## Stoichiometry

### Problems



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Stoichiometry is the study of the mass relationships in compounds and reactions. We have dealt with composition stoichiometry when we did percent composition and empirical/molecular formulas. Now we will study reaction stoichiometry, which is the study of the mass relationships in chemical reactions.

Reaction stoichiometry problems all come in one of 6 types:

1. mole to mass
2. mass to mole
3. mass to mass
4. mole to mole
5. volume to mass
6. mass to volume

However, all of these calculations begin with two facts:

1. Balanced equations give the ratios of moles of the reactants and products involved in the chemical change
2. The masses of the reactants and products can be determined by converting to moles.

Other mathematical calculations related to chemical equations are:

1. Limiting Reagents- is the amount of reactant that will be completely consumed (used up) and therefore limit the amount of product that will be made. Any other reactant left over is said to be in excess or a way to think of this: you have more than you need.
2. Theoretical and actual yield:
  - a. Theoretical yield is the amount of product you should get from the reaction.
  - b. Actual yield is the amount of product you isolate and can actually weigh on the scale.
3. Percent yield is how much you actually made (actual yield) compared to how much you could have made (theoretical yield).

$$\% \text{ yield} = \frac{\text{actual}}{\text{theoretical}} \times 100\%$$

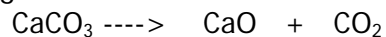
Responsibilities:

- A. Know the terms (see above information)
- B. The problems turned in on the answer sheet showing correct problem format.
- C. Stoichiometry Test
- D. Laboratory work: TBA

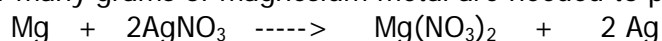
## Stoichiometry Problem Worksheet B

Show **ALL** work for stoichiometry problems.

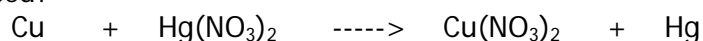
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1. How many grams of calcium oxide can be prepared from 50 grams of calcium carbonate?



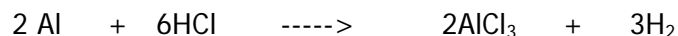
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2. How many grams of magnesium metal are needed to produce 1.0 gram of silver metal?



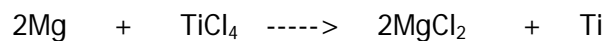
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3. If 55 grams of copper react with mercury II nitrate, how many grams of mercury metal are produced?



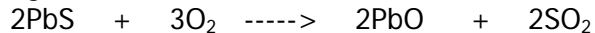
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4. When 70 grams of aluminum metal react with hydrochloric acid, how many grams of aluminum chloride are produced?



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5. How many grams of titanium metal are produced by reacting 10.00 grams of titanium chloride with magnesium?

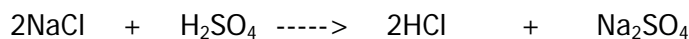


6. If 480 grams of lead sulfide are roasted, what mass of lead II oxide is produced?



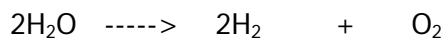
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7. What mass of hydrogen chloride is produced when sulfuric acid reacts with 200 grams of pure sodium chloride?



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8. In the decomposition of 156 grams of water by electrolysis, how many liters of oxygen gas are produced?



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9. How many liters of oxygen are required to oxidize 100 grams of aluminum metal?

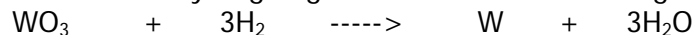


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10. If 25 liters of hydrogen are produced by the reaction of sodium metal and water, how many grams of sodium were used?

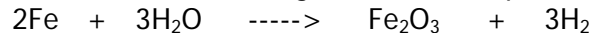


11. Calculate the volume of hydrogen gas needed to reduce 500 grams of tungsten oxide?



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12. Calculate the mass of iron reacting with steam to produce 6500 liters of hydrogen gas.



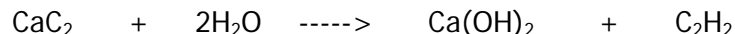
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13. How many MOLES of sulfur are needed in the production of 1800 liters of sulfur dioxide?



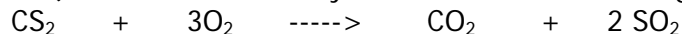
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14. If 500 grams of calcium carbide react with water, what volume of acetylene gas is produced?

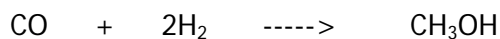


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15. If 150 mL of carbon disulfide ( $D_{20} = 1.26 \text{ g/mL}$ ) are burned, how many liters of sulfur dioxide are produced? (HINT: use the density as a factor to convert to grams!)

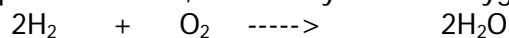


16. In the production of methanol, how many liters of hydrogen are needed to react with 475 liters of carbon monoxide?

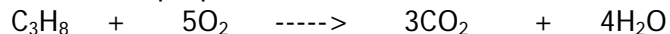


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17. To produce water, how many liters of oxygen are needed to react with 500 liters of hydrogen?



18. If 200 liters of propane are burned, what volume of carbon dioxide is produced?



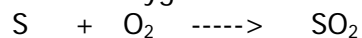
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19. How many liters of oxygen are needed to oxidize 500 liters of carbon monoxide gas?

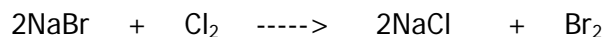


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20. How many liters of oxygen are needed to react with sulfur to produce 5000 L of sulfur dioxide?

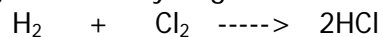


21. How many liters of chlorine gas are needed in the liberation of 300 liters of bromine gas from sodium bromide?



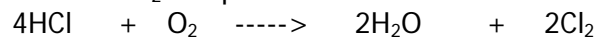
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22. How many moles of hydrogen chloride are needed to form 0.55 moles of  $\text{Cl}_2$ ?



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23. How many moles of  $\text{Cl}_2$  are produced from 6.30 moles of hydrogen chloride?

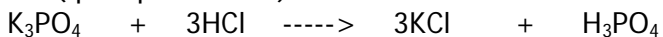


24. How many moles of potassium permanganate are needed to produce 0.76 moles of manganese chloride?

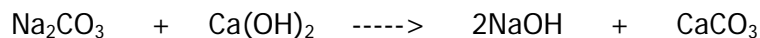


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25. If 120 grams of potassium phosphate react with hydrogen chloride, how many grams of hydrogen phosphate (phosphoric acid) are formed?

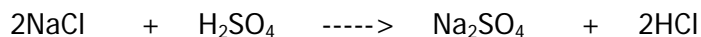


26. When 80.0 grams of sodium carbonate react with calcium hydroxide, what mass of calcium carbonate is produced?



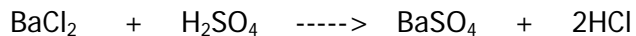
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27. If 90.0 grams of sodium chloride react with sulfuric acid, how many grams of sodium sulfate are produced?



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28. If 100.0 grams of barium chloride react with sulfuric acid, how many grams of barium sulfate are produced?

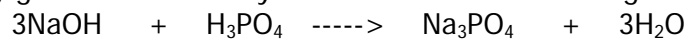


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29. How many grams of oxygen will decomposing 480 grams of potassium chlorate produce?



30. How many grams of sodium hydroxide will react with 150 grams of phosphoric acid?

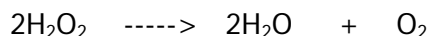


31. If 120 grams of mercury II oxide are decomposed by heat, what volume of oxygen is produced?



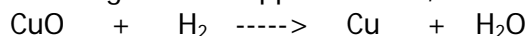
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32. When 70 grams of hydrogen peroxide are decomposed by light, how many liters of oxygen are released?



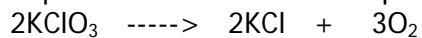
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33. In the reduction of 100.0 grams of copper II oxide, how many liters of hydrogen are needed?



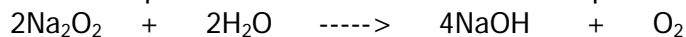
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34. How many grams of potassium chlorate are required to produce 90.0 liters of oxygen?



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35. How many grams of sodium peroxide must react with water to produce 75.0 liters of oxygen?

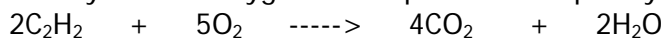


36. In the Haber process for making ammonia, how many liters of ammonia gas are produced when 4000 liters of nitrogen gas is used?

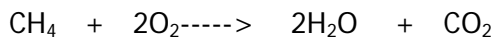




37. How many liters of oxygen are required to completely burn 1800 liters of acetylene gas?

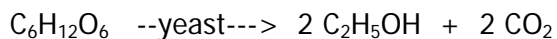


38. What volume of oxygen is needed to completely burn 225 liters of methane gas ( $\text{CH}_4$ )?



39. In the fermentation process, glucose can be converted to ethanol. How many milliliters of ethanol will be produced if 90000 gm of glucose are fermented?

(HINT: 1. find the number of grams of ethanol 2 Then use 0.8 g/mL to convert grams to mL.)



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40. During the incomplete combustion of 5000 L of propane, how many grams of soot (C) are produced?

